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East Europe Report

SCIENCE & TECHNOLOGY

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EAST EUROPE REPORT

SCIENCE & TECHNOLOGY

CONTENTS

YOUNG SCIENTIST DISCUSSES STATE OF RESEARCH IN BIONICS

Sofia OTECHESTVO in Bulgarian No 6, 1984 pp 10-11

[Article by Vasil Dimitrov: "A Strange Profession"]

[Text] Evgeni Dyukendzhiev is a mathematical engineer with biological training. He is one of the first Bulgarian specialists in the area of bionics and the first Bulgarian scientist to win a gold medal from the World Organization of Intellectual Property [Achievement] in 1983. In the same year he also received an honorary decoration from the Bulgarian Academy of Sciences [BAN] for contributing to Bulgarian science.

After I completed the Kh. Stoyanov Mechanical Technical School in Veliko Turnovo in the specialty of internal combustion engines, in 1970, I found myself a student at the Lenin VMEI [Higher Electrical Engineering Institute] in the specialty of materials handling construction equipment. I had no particular problems with my studies, but I felt a dissatisfaction with the engineering sciences in their classical form. I was constantly comparing engineering problems with those of biology and biological evolution. The living world is so harmonious and so full of elegant "technical" solutions that at times I was even ashamed to miss the chance to look at modern problems from a different viewpoint for the sake of an engineer's misconstrued self-esteem. These "heretical" thoughts were the reason for my completing also applied mathematics with a specialization in biology. During the spring of 1976 I received what was for those times a strange qualification of a mathematical engineer with biological training, that is, a bionics specialist.

I started working as a designer at the Technical Development Base for Construction and Road Machinery in Debelets and in 1978 I entered the Institute for Heavy Machine Building in Radomir. During those years I continued my research in the bionics area at the circle under the Okrug Station of Young Technicians in Pernik. The advantage of such activities is that both the leader and the circle members (secondary school and higher institution of learning students) are equally crazy and do not look for flaws in each other. As a souvenir of those fine years there was the development of our first biocontrolled prosthesis and an anthropomorphic (human-like) industrial robot. And on a day of wit and joking, 1 April 1980, I was appointed a scientific associate at the Institute for Mechanics and Biomechanics under the BAN, where I defended my candidate's dissertation. I am still there.

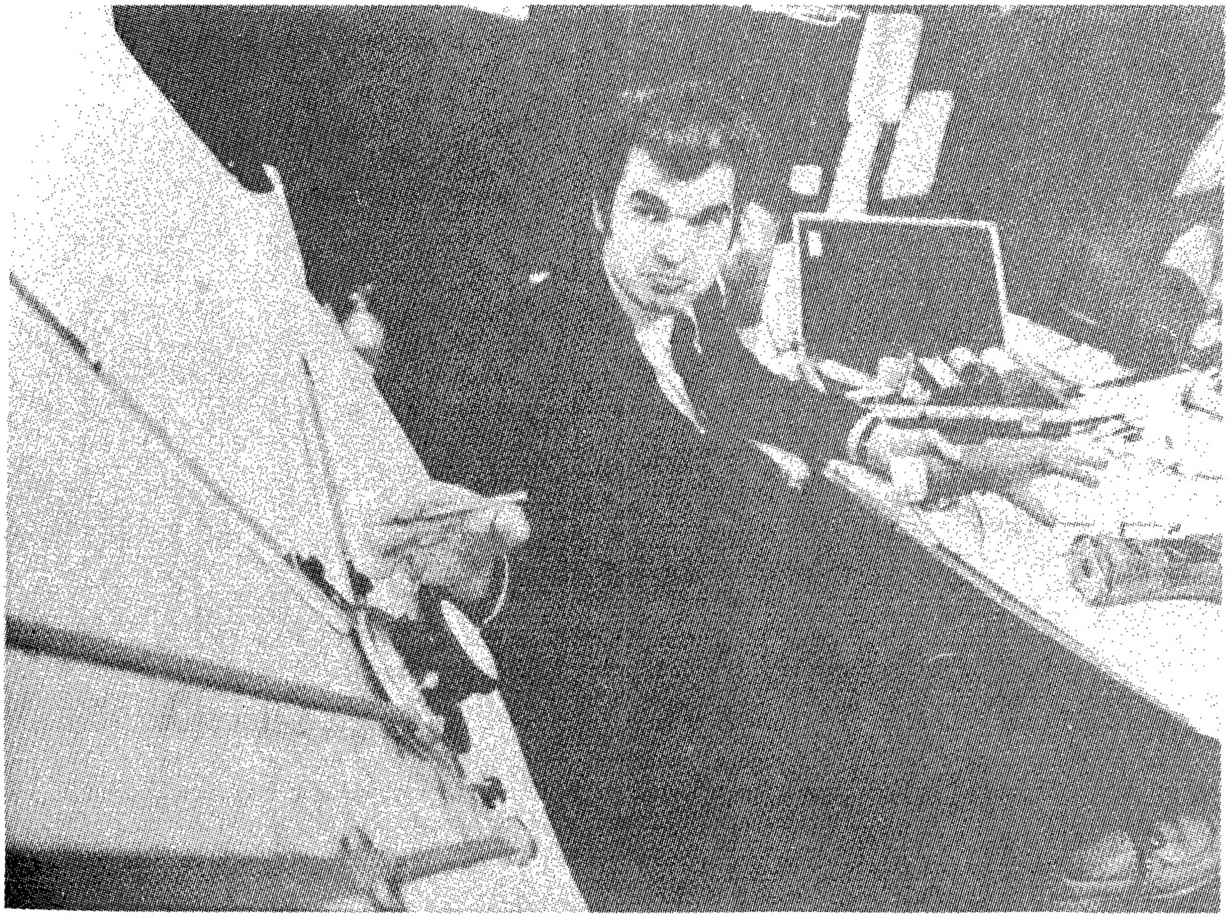
As a science, bionics is 10 years younger than I am, as it was officially born in September 1970. But this certainly does not mean than it has been easy to tame. It studies living prototypes--man, animals and plants--and has the practical aim of developing devices and technical complexes which are similar to them. Bionics has been developing in several areas--neurobiological, image recognition, orientation and navigation, bioenergetics and biotechnical robotics. I am a specialist in biomechanics and the results of my work are related predominantly to biotechnical robotics.

However, I would like to caution young specialists who are setting out on this path that it is very hard for a person to be involved in interdisciplinary sciences. You give a paper, for example, on bionic modelling of man, and you are on bad terms with one half of your colleagues. Physicians are distressed by a simplified analysis of the skeletal-muscular system, the mathematicians multiply an approximate theoretical model by zero, and the engineers openly classify the work as not to be taken seriously. But it is very serious. Max Kramer in the 1960's studied the motion of dolphins and developed a new artificial skin. The "sheathing" of a torpedo with this increased its speed by almost one-third. Prof Ignatiyev from Leningrad has developed a walking robot which is modelled after a spider and for years at the University of Australia an "iron" kangaroo has been hopping about the laboratories. In distant Siberia, Engr Nikolayev, from the example of the penguin, has designed a self-propelled walking machine which moves through deep snow at a speed over 40 km per hour. Other achievements of bionics could also be mentioned such as the artificial muscles, organic computers, radars which are like a bee's eye, thermosensors which like a cobra discover a target scores of kilometers away from the temperature differences.

Physics was the basis of science in the 1920's and in my opinion, bionics will be its worthy heir. A visionary science which dialectically brings together the eagle, the crab and the pike under the integral sign has linked once and for all the soldering iron with the scalpel, the emblem of bionics.

At present, under the leadership of Academician G. Brankov, I am engaged in research on man in the aim of his bionic modelling. Years ago I started with the wrist, after which in series came the entire arm, the shoulders and the head and the spinal column. I have been working jointly with Science Associate E. Levenova on the structure of the lower extremities. What have the results been? At the end of October 1983, at the Plant for Low-Voltage Relays in the village of Banya, Blagoevgrad Okrug, we produced a prototype series of a bioelectrically controlled prosthetic forearm which was classified as an invention. Together with my co-workers we have developed the first Bulgarian range of two-handed assembly robots. With Engr Kilifarov, we are synthesizing a new method of bioelectrical control for mechanisms and we have the opportunity to introduce a range of bioelectrical stimulators for accelerated rehabilitation at the Institute for Orthopedics and Traumatology. In addition to this, we are rapidly training bionics personnel through the forms of TNTM [Movement for Youth Technical and Scientific Creativity] and postgraduate training.

Both my colleagues and I have grown tired over the years wondering whether finally we shall be removed from the so-called "paragraph 6" or unlisted personnel, and will be given staff positions, even with temporary labor contracts. We have built our own laboratory, but we cannot equip it with the proper instruments and machines. Capital investments are needed for this. And these things depend upon the Central Administration of the BAN and the DKNTP [State Committee for Scientific and Technical Progress]. Well, they have been promising us....



Engr Evgeni Dyukendzhiev demonstrating the PD-2 bioprosthesis for restoring a human hand in an amputation. It has 16 degrees of mobility, it is battery operated and has a single-channel bioelectrical control

And now a personal metter. Recently I have been talking with my close friends about mastering another more promising profession such as a football player, for instance. Even if my wages remained the same, at least I would be given housing immediately. Otherwise, the only solution is a divorce or to leave the BAN. For 4 years now, my wife, child and myself have been living in a cellar 7 steps underground, with one toilet for the entire building. There is at least one good thing--it is cool in the summer. One other thing. I would like greatly to see the effectiveness of a young specialist's intellect increased by resolving the accompanying problems of an organizational and domestic nature. An invention at times leads to an economic effect worth millions of leva. Consequently, it is worth creating the prerequisites for its birth.

But let me return to the problem of biotechnical robotics. It already is defending its right to existence and is carrying out a number of tasks left aside from the possibilities of functional robotics. For example, before the year 2000 it is quite possible that there will be a Bulgarian anthropomorphic domestic robot. Before the end of the five-year plan we expect the initial introduction of anthropomorphic robots in localized production sectors, the so-called microflexible automated production systems. Before too long our nation will have a range of bioelectrically controlled prostheses for the human upper extremities. There will be experiments with femoral bioprostheses and exoskeletons for severely paralyzed patients. It is fully possible to shift accelerated rehabilitation to home conditions by utilizing the bioelectrical stimulators. In addition, we are expecting the first graduating class with a major in bionics. By all this, the Bulgarian school of biomechanics will confirm its leading position in world science.

10272
CSO: 2202/8

TECHNICAL DATA ON IZOT-1027S MICROPROCESSOR SYSTEM

Sofia RADIO, TELEVIZIYA, ELEKTRONIKA in Bulgarian No 2, 1984 back cover

[Text] The IZOT-1027S system for automated design.

The IZOT-1027S microprocessor system is designed for automated control program preparation for metal cutting machines with accessories for digital program control (DPC). It not only cuts down on the means and the control program preparation time with its speedy operation, simplicity, and convenient operation, it also optimizes the programming of accessories with DPC.

The programming language is a modification of the ART language which, with its simple and logically clear operators, makes learning programming easy. The input program is compiled directly from the sketch of the detail.

The basic technical characteristics are:

1. The software makes it possible to:

--program lathes with Digital Program Processors,

--program cutting machines and processing centers with DPC,

--edit control and detail programs,

--use variables,

--operate with subprograms,

--organize cycles.

2. Type of control--microcomputer.

3. Central memory capacity--64 kilobytes.

4. Display--24 lines x 64 symbols.

5. Memory of Graphic Mode Display--2x 250 kilobytes capacity, exchange speed--250 kilobits per second.

6. Printer--30 characters per second, 64 characters in a line.

7. Perforator of perforated tape--250 characters per second.

8. Perforated tape reader.

9. X-Y plotter (at user request)--150 millimeters per second, format 237 x 420 millimeters.

6. Printer--30 characters per second, 64 characters in a line.

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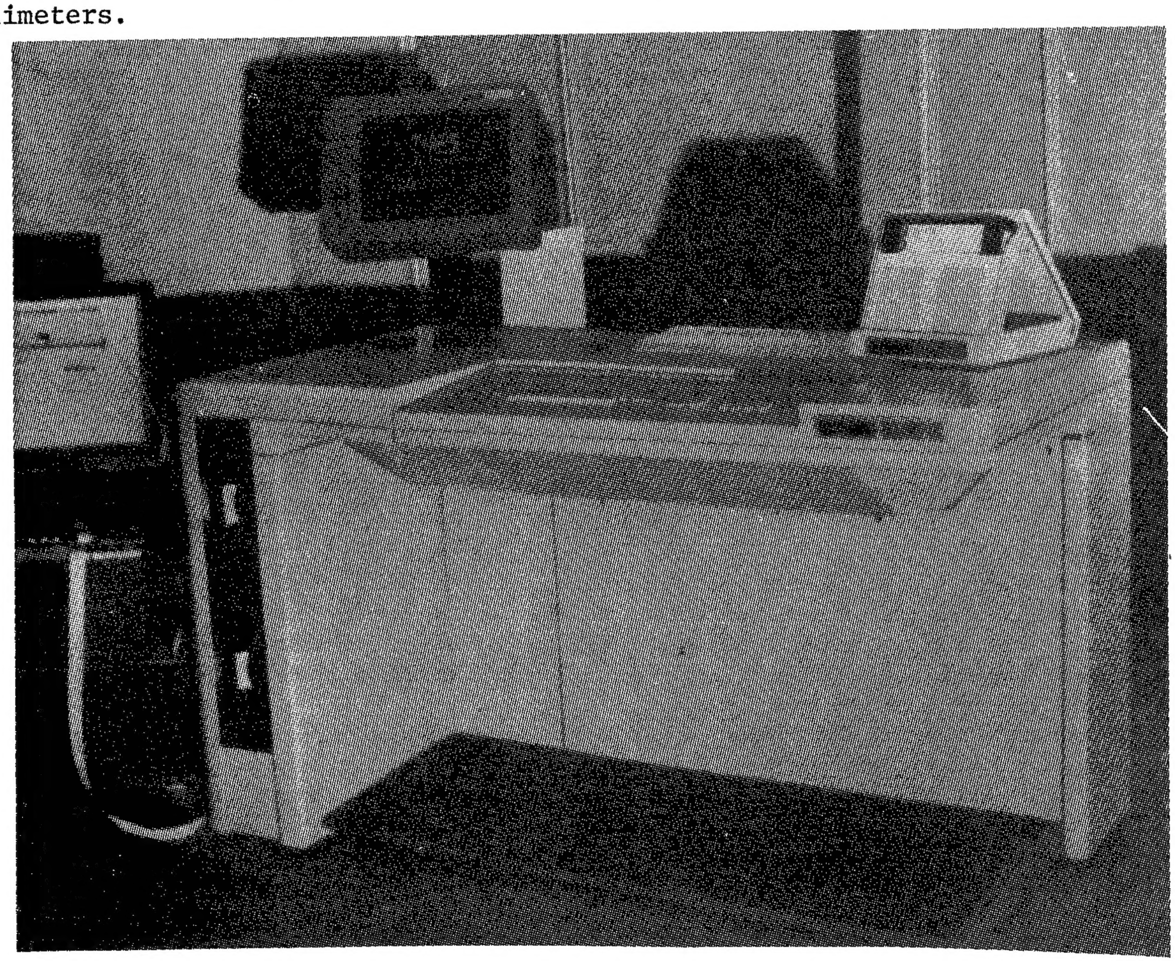

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ORGTEKHNIKA COMBINE LISTS SOME OF ITS PRODUCTS

Sofia TEKHNICHESKO DELO in Bulgarian 10 Mar 84 p 14

[Text] The Orgtekhnika Combine offers the following products through the subdivisions of the Tekhnosnab Economic Marketing Enterprise:

The IZOT-1024S wordprocessing machine designed for creating, correcting, editing, and copying text documents;

The IZOT-1024S Office Computer, a specialized microprocessor system for economic information processing. It is designed to operate in planning-economic and finance-accounting departments of industrial enterprises, the State Savings Banks, agroindustrial complexes, and others;

The IZOT-1008S Benzine problem-oriented complex (POC). It is designed for automatic fuel filling and lubrication of automobiles at administrative gas stations. The complex controls eight gas pumps, but it has the capacity to handle twice as many. The IZOT-1008S reduces to a minimum the possibilities of fuel abuse and provides effective control;

The IZOT-1015S Commerce POC, designed for building automated workplaces with automatic or manual data input at all kinds of commercial sites; it provides itemized control or profits.

Also produced are electronic cash registers:

The ELKA-81 automatic cash register with a built-in IZOT-340 licensed printing device designed for service in commercial stores, supermarkets, warehouses, canteens, and others;

The ELKA-90, designed for average-size and large commercial sites; it offers the possibility of quick, convenient, and automated data input and accounting of items sold at the given commercial site. An important feature of the ELKA-90 is that it is designed for operation with the IZOT-1015S-POC Commerce system, which gives it the opportunity to control the operation;

The ELKA 92, designed for public food establishments--restaurants, pastry shops, bars, canteens, and others. The ELKA-92 provides complete financial control of the establishments where it is used;

The ELKA-98, designed for public food establishments. It provides complete financial control at establishments where it is used.

For information and business contacts:

Orgtekhnika Combine in Silistra

Telex 64576

Telephone numbers:	Director	2-28-87
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	Engineering enterprise	2-29-12
	Operator	2-67-11 (15)

12334
CSO: 2202/7

VALUE OF CERTAIN CORN HYBRIDS CRITICALLY EXAMINED

Sofia KOOPERATIVNO SELO in Bulgarian 12 Mar 84 p 2

[Article by Nikola Tomov, senior scientific associate, director of the Institute for Corn in Knezha, and Simeon Mitev, senior scientific associate, candidate of agricultural sciences, chair of the Selection Department: "Science Has Given the Right Answer"]

[Text] Select grade structure is one of the most dynamic links in the network of activities which ensure the fulfillment of production programs. It leads to yield increases, without any additional capital investments. During the last decade, the yield of corn in developed countries, including our country, has increased each year by 10-15 kilograms per decare. Sixty percent of this increase is due to the uninterrupted development of hybrids with higher yields, and 40 percent to improvements in technology. That is why interest in hybrids is logical and justified. Are we always applying, however, the most effective and optimal select grade structures in each micro-rayon? The answer is definitely no.

There are several reasons for this, and not taking them into consideration leads to deviations from the guidelines established by the Institute for Corn, as the result of many years of experience and observation. Unfortunately, the institute is not the organ which could apply its concepts in practice, and there are often select grade structures in production which have not been scientifically proven.

The select grade structures do not comply with the sum of effective temperatures, which is different from various okrugs, rayons, and agroindustrial complexes. Our country has clearly expressed horizontal and vertical zonal characteristics with respect to temperature conditions. The territories of many of the agroindustrial complexes, and especially those in mountainous areas, are situated on the crucial boundaries, above which the hybrids cannot attain complete ripeness. Some places, however, carried away by the aspiration to obtain the highest yields, prefer the latest hybrids, hoping they will ripen. The latest hybrid, with its greater photosynthesizing area, which is also active for a longer period, has plants with higher

individual productivity. This is so, but not under all conditions. When spacing is optimal, the yield from earlier corn is close to the yield from later corn. Yields from early hybrids of 700-800 kilograms of grain per decare are not excluded. This yield has been obtained almost throughout the country, and not only in 1 or 2 decares, but in hundreds and thousands of decares. Emil Stoykov from the Kula agroindustrial complex Vidin Okrug has obtained such a yield; he comes to the institute several times each winter asking if can test new hybrids in his well-controlled experimental fields, and he sends back his results every fall. Last year's experiments showed a yield of 1260 kilograms per decare for N-708, 1176 kilograms for Kn-530, 1242 kilograms for Kn-430, and so forth. The figures positively demonstrate that even earlier hybrids can yield very good results when the correct technology has been applied.

Our studies, conducted over many years, show that, under the conditions at Knezha, a mixture of 10 percent early to mid-season, 20-25 percent later season, and 65-70 percent late season hybrids attain a yield only 4-5 percent lower than a crop of late corn. The difference is made up several times over, however, because three times as much energy is used to dry 1 gram of corn seed than to obtain it in the first place.

When raising only one type of hybrid, with respect to the vegetational period, the probability of vegetation under favorable conditions is as great as when it is developed under unfavorable conditions, due to differences in climatic conditions throughout the years. The results obtained do not support the idea of cultivating only one type or even only one hybrid, as is the case with N-708 at many agroindustrial complexes. The temperature conditions in Knezha allow even the latest hybrids to ripen. What often happens, however, in the rayons at a higher altitude, where the temperatures are lower? The last two autumns were warm and dry, so we almost forgot that it can also rain in the autumn, rain softly for days, even weeks in a row. Then the corn does not ripen, and the whole plant can be harvested, but the planned-upon quantities of corn would not be yielded. Another possibility is to wait until the corn ripens very late in the fall. What if it rains every other day and the soil is wet and muddy? The combines advance slowly, even aided by one or two tractors pulling them. Behind the combines, at meter-long intervals (or even closer together) there are spills of big, yellow cobs.

We should not cultivate hybrids from the same ripening-term group also because of the crucial points in corn development with different vegetative periods occuring within different calendar terms. Besides, under non-irrigation conditions, in order to produce a normal yield during its vegetation, the corn needs a minimum of 300 millimeters of rainfall. There are few flat country rayons with this amount of rainfall. Under such conditions, the earlier corn has better yields because it benefits more from the fall-winter rainfall. For those areas with a maximum of rain in June and July, the early corn is more appropriate because the crucial points of its maturity coincide with the summer rainfall maximum. In those years, however, where the rainfall conditions require harvesting earlier corn under non-irrigation conditions, it is not usually sown.

Because of the fact that economically significant diseases often attack the plasm of only one type, preferably, of corn and lower its yield by 20-30 percent, care should be taken not to sow only one type of hybrid and especially one hybrid only. The genome of the late hybrids has a lower genetic basis. This means that they are obtained from genetically kindred lines. It is not difficult to imagine what the corn yield would be for some agroindustrial complexes, if the hybrid N-708, for example, were to be attacked by a certain disease.

When we speak about select grade structure, we should keep in mind the complex of organizational and economic factors which require rhythmic corn production and the avoidance of peak periods. Finally, there is the fact that corn is the main predecessor of winter cereal crops, and in order to receive good yields from them, they should be sown during the optimal time periods and in well-prepared soil. The results from experiments in Silistra Okrug show that wheat develops very well after earlier hybrids.

Do we have a variety of hybrids available in order to build such a select grade structure? There was a time when we did not have such hybrids. This made it necessary to import foreign hybrids, such as Anjou-256, P-3978, Anjou-360, KVVC, Px-20. However, the best rayon-oriented early- and early-to-mid-season hybrids today are Bulgarian, one indicator of which is the fact that the standard for early corn in 1984 will be Kn-180, and for the early-to-mid-season corn, Kn-430. The standard for mid-to-late season for 1984 is also the Kn-530 Bulgarian hybrid. The high yield types Kn-557, Kn-510 and Kn VP-556 are also in this maturity group. In other words, we have successfully applied Bulgarian corn in three or four maturity groups.

For the basic group of later maturity, however, the hybrid N-708 will again be the stnadard for 1984. During last year as well this hybrid remained the strongest and the leading type worldwide. It hurts us a little bit because it is not Bulgarian; we grow it from a handful of grain, we have sterilized it and we are improving its quality, and its quick adoption will obtain millions of tons of grain for our country. We believe, however, that the efforts of selectors all over the world, including Bulgaria, will be rewarded. The first "swallows" appeared with the Kn-641 and Kn-711 hybrids, which show that the N-708 will be overcome. The State Select Grade Commission this year will have a whole range of late-yield hybrids available. They are our hope and the reward for our round-the-clock labor.

12334
CSO: 2202/7

HISTORY, FUTURE OF EXPERIMENTAL NUCLEAR REACTOR REPORTED

Budapest NEPSZABADSAG in Hungarian 24 Mar 84 p 4

[Article by Gabor Pal Peto: "The Birth and Rebirth of 'Methuselah'"]

[Text] The Csilleberc Nuclear Reactor Is a Quarter Century Old--What Will the Second Reconstruction Bring?

The pages of the old, first operating log are already turning yellow but the people who at the time were participants of the unforgettable event even remember the things they did not then have time to put into the log:

"The reactor reached the critical state one minute before 10 PM, we were controlling it manually then, then switched it to automatic six minutes past eleven. Between the two times we let in the three-meter high water layer onto the active zone. But who had the time then to write this in?"--says Zoltan Gyimesi. He was one of the reactor's two operators which is not a subordinate, mechanical activity: at the time Gyimesi was deputy to the experimental nuclear reactor's chief engineer, Gyozo Verle!

The old photograph made at six minutes after 11 PM is only an amateur picture but it is an irreplacable document: It shows not a staged scene but was made there during work, everyone is visibly absorbed by the task, and they don't even look toward the camera. Lajos Varkonyi, Gyozo Verle and Zoltan Gyimesi are sitting by the control console, with tension on their faces.

"That young man with the face of a student who is leaning forward, was the plant engineer in charge of the water...that was me"--reminisces Ferenc Szabo, head director of the Central Physics Research Institute [KFKI] and corresponding member of the Academy.--On the left is a young candidate who participated in the measurements and was deputy director at the time: Lenard Pal. Stolerov, the Soviet advisor is standing in the rear. He has died since. This lady here is his interpreter.

The Date Pit Conspiracy

As if it happened yesterday, the event lives in the participants. This is how the 4 April 1959 issue of NEPSZABADSAG reported it: "The National Nuclear Energy Commission reports: Construction of the first Hungarian 2 MW experimental nuclear

reactor purchased from the Soviet Union and built with its assistance has been completed. It was placed into operation on 25 March of this year. Since then the reactor has been operating a few hours a day and has also reached its maximum capacity. The experimental nuclear reactor serves research purposes and to train reactor professionals. In addition it also produces radioactive isotopes." And one more brief paragraph about how the operating tests have been completed, experts from the Ministry of Health also participated in checking it out, and the reactor is operating without any problems.

The preliminaries of this event which projects into the distant future reach back a long way: The SZABAD NEP reported way back on 14 September 1956 that the first shipment of 45 tons of instruments and machinery for the nuclear reactor has arrived.

Zoltan Gyimesi recalls: "The design of Building No 10--I think, very fortunately --was entrusted to the IPARTERV [Architectural Designing Enterprise for Industry and Agriculture] and to the EROTERV [Designing Enterprise for Electric Power Plants], and construction to the ERBE [Electric Power Plant Investment Enterprise of Dunapentele-Sztalinvaros]". He adds: "But everything else came from the Soviet Union, even the steel steps leading up to the top of the reactor."

And the start-up? We knew that many people were afraid of the event (since even now, 25 years later many people think that atomic bomb, nuclear reactor, nuclear power plant--they are all the same: just as dangerous!), therefore we kept it a secret when it would take place. On the morning of that 25th of March I walked around conspicuously in the KFKI and was looking for ceramic pots and good soil for two date pits. Thus everybody thought: if this is the kind of thing Gyimesi is concerned with, then at least today it certainly will not be started up... Oh, by the way: I did find good soil and pots, we planted the two pits, and huge, beautiful date palms grew from both of them."

(We could even consider this as a symbol: the symbol of growth of the nuclear energy industry in our country.)

"The checking of all equipment once more for the last time began at 6 PM"-- continued the operator of that time with his recollections. (He is now the director of KFKI's Nuclear Energy Research Institute.)--"The signatures are here in the log."

"It says here that we began to insert the heating element bundles--at the time we called them 'baskets'--at 8:42 PM; but, of course, it cannot say here how apprehensive I was when, leaning over the opening in the reactor's cover, one by one I adjusted the bundles lowered in by the long rod"--recalls Ferenc Szabo. "Yes, you can even see it on this picture. And Andras Adam is sitting here up front, and records the curve which in no way wanted to be like the one described in the trade literature. And actually this was what started reactor research in Hungary, because we then assembled the SR-1, the first subcritical small research reactor from the spare heating elements, in order to clear this up."

The First License

"Of course there is a long story preceding this also"--Zoltan Gyimesi continues. "In the industrial department of the Council of Ministers' secretariat a young man directed the selection of those who then went to the Kurchatov Institute in Moscow for a three month training course." (The one-time young man: Ferenc Szabo smiles in agreement.)--"We studied and worked there from 8 AM to 7 PM, then took an examination and that was when I received my first license, but it was not for a car but for a nuclear reactor."

"The first day's work lasted barely an hour"--Ferenc Szabo returns to the day of 25 years ago-- "we shut down the reactor, drank the champagne we had chilled in case we were to succeed, which, I hasten to add, we did not buy from expense account money but from our own, and went home."

"We started it up again the next day"--recalls director Gyimesi, laughing--"and I saw from the window that on seeing the water vapors leaving the cooling facility, people who were crossing the yard were turning back and going in other directions... Of course they soon got used to it and nobody worries today because of the reactor."

"And they are right"--says Ferenc Szabo who from the autumn of 1959 was directing the scientific work concerning the reactor, then manager of the reactor, later director of the Nuclear Energy Research Institute, and even today nostalgically recalls the years spent in No 10.--"During these 25 years there was not one single operating problem at the experimental nuclear reactor! Of course there were some unplanned shutdowns but the reasons for these were either power failure or human error, but the reactor never 'broke down'".

And work did begin immediately. Just as the official announcement said accurately: scientific research projects, production of radioactive isotopes, and training of professionals--and, I might add, the creation of a new culture--because such an installation is a real catalyst.

A brief review of the last quarter century, which can be broken down into two parts: the periods before and after the 1967 reconstruction. This latter was planned and carried out entirely by the KFKI's experts, and as a result of it the reactor's thermal capacity increased from 2 MW, the neutron density ("flux") in the channels used for irradiation was doubled, as did the number of channels, and the number of containers holding the irradiated isotopes tripled.

Can't Even Be Expressed In Terms of Money

The results of scientific research fill huge volumes. Nuclear physics research projects, solid body physics research in which the neutrons are used as "microscopic probes", nuclear measurement technology developments (which they can really appreciate in Paks!), activation analysis with which so-called trace elements present in very small quantitites can be identified, a booster effect on domestic computer technology developments ("the first multichannel analyzer was as big as this room"--Ferenc Szabo pointed around in his working room, "and its mechanical counters sounded like a machinegun!"), the training of experts,

certification of radiation dosimeters (measuring instruments for radiation dosage)...it would take a long time to list all the things the experimental nuclear reactor provided. From the long line of its visitors we must mention the mice. This is no joke: several thousand mice were irradiated so that biology researchers could experiment on them with chemicals to provide protection from radiation.

And perhaps the most widely known work: the production of radioactive isotopes. (These are packaged and shipped by a separate institution, the Academy's Isotope Institute.) The value of radio isotopes produced in 1970 was 9 million forints--which was the value of 7,550 shipments--, in 1983 24,000 shipments rolled out of the Csilleberc gate, their value was 67 million forints. The value of export reached 37 million forints, within this the capitalist export was $136,000. Production of radiopharmaceuticals which began in 1980 made the import of $680,000 value unnecessary. And the value created by the application of radioisotopes in industry, agriculture and health care can probably be expressed in terms of millions.

This anniversary is not only for looking back but also for looking forward. At the end of next year the Csilleberc "Methuselah" will begin a real rebirth: it will be shut down and reconstructed with work that will last for two years--it will be done exclusively by Hungarian experts, with Soviet consultation. Its output will quadruple, so will its usable neutron flux, and the isotope production capacity will increase tenfold. The reactor's research capabilities will expand, its safety technological equipment modernized.

If we know that twenty institutions and enterprises have made use of the experimental nuclear reactor, and through the use of isotopes almost 300 domestic users have come into contact with it, we can understand the significance of this anniversary--and the great opportunities and future the reconstruction promises.

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CSO: 2502/48

GD 80 GRAPHIC DISPLAY SYSTEM

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 21 No 1, Jan 1984 back cover

[Text] The GD 80 system is a series of vector mode graphic displays with several microprocessors. The modular design of this family allows building displays with various performance characteristics by replacing or adding components. Thus, systems can be built for general-purpose tasks or for special graphic applications.

Display options are monochrome or four-color with small (190 x 254 mm) or large (507 mm diagonal) screen.

The display is produced by the Display Control Unit (DCU) by using generators, amplifiers, and image software which is stored in Common Memory (CM). The DCU also controls the light pen function, while other peripherals are handled by the Graphic Peripheral Controller (GPC) through the Bus Controller (BC) for the Graphic Peripheral Interface Bus (GPIB). Other communication capabilities are available through installing these elements: U1 Bus, U2 Bus, Host Interface (HIF), ASTRO (Asynchronous/Synchronous Interface).

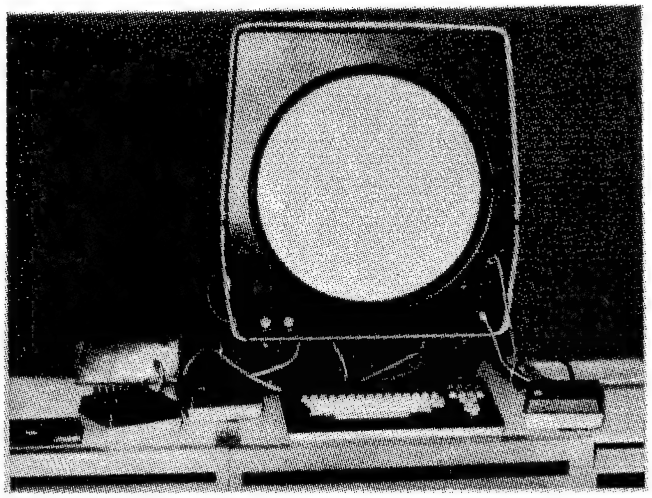
Options to increase performance are the Display Processing Unit (DPU) and Transformation Processing Unit (TPU).

These GD 80 versions with various equipment options are available:

--GD 80 BT. This is the simplest family unit; it can be used as a graphics terminal for a computer, for example; peripherals are handled through the GPC; communication through the ASTRO or HIF.

--GD 80 GC. Intelligent graphics desktop computer; the arithmetic expansion module (APU) is used as support for the GPC; floppy disks are used as secondary storage; BASIC interpreter, expanded with the MGSS 80 line-drawing package.

--GD 80 IT. Intelligent terminal with higher performance; communication to a higher- ranking computer through a modem or direct to a multiplexer channel.



--GD 80 AGS. Standalone graphics system for complicated jobs; the DPU/TPU processing pair emulates a small computer instruction set and the floating-point expansion; storage expansion through magnetic disks or tape; higher programming languages are possible (BASIC, FORTRAN GESAL); designed especially for CAD systems.

--GD 80 SGS. The SGS (Satellite Graphic System) version is the largest in the system; essentially matches the AGS, the communication capabilities of which can be expanded by the HIF.

Some system peripheral options are:
--YeS 5074 floppy disk drive, 256K bytes/side, DMA interface to the GPC
--SM 5400 disk storage unit, 12 or 24 sectors, DMA interface to the U1 bus
--YeS 5017 magnetic tape drive, 9 tracks, 2 m/s, DMA interface to the GPC
--DZM 180 line printer, 7 x 9 dot matrix
--alphanumeric keyboard
--trackball
--light pen.

The software consists of a set of program modules built around the GSS 80 vector plotting package as the nucleus. Some basic software modules are: Supervisor, Assembler, FORTRAN, BASIC, GESAL as the systems programming language, communication software, emulators, file handling, editor, debug, etc.

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CSO: 2302/30

VT 20/IV OFFICE COMPUTER SYSTEM

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 20 No 7, Jul 1983 back cover

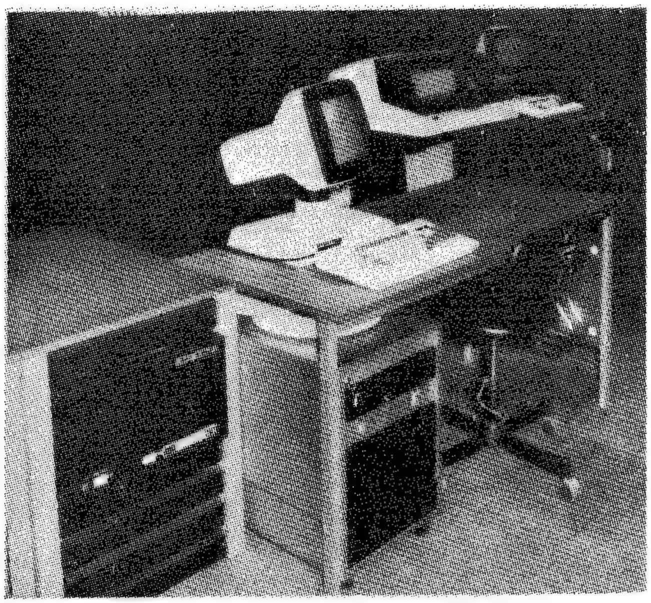
[Text] The VT 20/IV office computer system is the newest product in the familiar VT-20 series, consisting of four work stations with equal access to a central unit. The hardware design reflects the system concept:
--expensive resources (disk storage and printer) shared by all work stations.
--inexpensive resources (CPU and RAM) housed in each work station.

The central unit is housed in a separate cabinet. Compared to the previous VT 20 A model, these changes have been made:
--The magnetic disk driver is controlled by a microprocessor performing not just physical, but also certain data file handling functions.
--The multi station function is supported by major hardware: Each work station has its own microprocessor and RAM.

Central Disk Controller. The disk controller is housed on two boards. Memory consists of 64K RAM and 6K ROM. With a corresponding reduction in RAM, ROM is expandable to 16K bytes. Four disk drives (8 logical disk units), each with up to 50M bytes, can be connected to the central disk controller.

Central Processors. Each work station has its own CPU board with 64K RAM and 4K ROM. In addition to the CPU and memory, the card contains the V. 24 or 20-mA current loop interface adapter.

Peripherals
--VDT 52 500 Display. Compared to predecessors, the monitor has a new shape, which also meets ergonomic requirements with swivel and tilt.
    --12-inch diagonal
    --24 x 80 characters plus 1 status line
    --256 characters
    --two brightness levels, inverse display, blinking, and others.
--300 lpm character band printer
--two 2.5M or two 5M-byte disks.



Software. VT 20/IV software system functions are distributed to the individual hardware components.

The disk controller ensures common resource handling for the data file handling program and the SPOOL-printer.

Each workstation has its own operating system which uses the common resources. With this software structure, the workstations are largely independent, and there are hardly any run-time differences between single- and multi-station operation.

In addition to the basic software (operating system, disk processing software, program development aids), options include the ISFMS index-sequential file management system and capabilities of operating with FORTRAN, BASIC, COBOL and PASCAL.

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VDT 52100 TERMINAL SERIES

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 19 No 10, Oct 1982 back cover

[Text] The Hungarian VIDEOTON VDT 52100 series alphanumeric display terminals are controlled by a microprocessor; they can be used for the most varied tasks because of their modular design in several versions: from the simplest telegraph-compatible model to the intelligent terminal.

These tasks are within the capabilities of the VDT 52106 data display terminal:
--data input/output
--text editing
--data set changes and updates
--data representation
--printer substitute.

The microprocessor controls the character representation, interfaces and memory. Modular design and use of only one common bus allow appropriate terminal expansions and modifications to suit the user. The keyboard switches work on the Hall principle and are therefore very reliable. The keyboard connects to the monitor section by cable using the normal TTY interface. It has alphanumeric, punctuation and special characters to control terminal operation.

Other VDT 52106 Features

--CCITT V.24, 20V/20 mA current loop interface
--selectable data transfer rate: 75 to 9600 baud
--parity formation and checking, error indication
--compatible with the VT 340 terminal
--compatible with the ESER [Unified System] and the MSR [not further identified].

The photograph shows the VDT 52113 terminal with two magnetic tape cartridge drives for secondary storage (photo by Boden).

Specifications

--12" diagonal monitor
--16 lines
--80 characters per line
--1280 character capacity
--unified KOI-7 code
--7 x 8 dot-matrix character format
--9 x 12 dot-matrix character cell
--blinking underline cursor
--50 Hz video frequency
--96 characters in set: Latin, capital and lowercase, punctuation, numbers, control characters
--normal and underline modes
--weight of monitor section (kp): 19.5
--keyboard weight (kp): 5.5
--monitor section dimensions: 500 x 495 x 360 mm
--keyboard section dimensions: 500 x 225 x 95 mm
--power requirements: 220 V + 10% - 15%, 50 Hz ± 1 Hz
--maximum draw: 130 VA
--operating conditions: +5°C to +40°C; maximum 90% relative humidity, uncondensed.

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PROBLEMS OF TELECOMMUNICATIONS INFRASTRUCTURE

Budapest HIRADASTECHNIKA in Hungarian No 12, 83 pp 547-551

[Speech by Dr Ferenc Valter, Hungarian Post Office, given at the 2 May 1983 scientific session of the Hungarian Academy of Sciences: "Problems and Developmental Trends of the Domestic Telecommunications Infrastructure"]

[Text] Dr Ferenc Valter obtained his diploma in 1958 in the signal technology and weak current section of the Electrical Engineering School of the Budapest Technical University. He began his professional work in 1958 in the Radio Technology Office of the Hungarian Post Office. Until 1970 he worked in the area of transmission technology and microwave, between 1965 and 1970 as chief of the development department. Between 1970 and 1980 he worked in the area of postal and telecommunications investment, until 1975 in the Postal General Directorate and thereafter as director of the Central Investments Office. Since 1 September 1980 he has been deputy to the Postal Director General, where his specialty has been guidance of telecommunications development and operations. In 1980 he earned the title electric engineering organization engineer and in 1982 he earned the title technical doctor in systems analysis and operations research at the Budapest Technical University.

Summary: The domestic telecommunications infrastructure has been the subject of a number of studies and papers in the recent past, approached from various sides. Going beyond the technical and economic effects of the backwardness of our telecommunications the paper also shows the social problems. The way out of the present serious situation is to produce a technical, economic base for development and a liquidation of the backwardness at a pace more swift than at present. The developmental strategy defined in the long-range plan of the Hungarian Post Office holds the use of digital switching and transmission equipment to be fundamental. We must expand significantly the use of wireless transmission equipment in the telephone, telex and data networks.

> Accelerating the development of the domestic telecommunications network will require close cooperation and a high degree of concentration of intellectual capacity on the part of domestic scientific organizations, industry and the Post Office--in harmony with the development of the electronics industry.

The information needs of the economy and society, the organizations of production and distribution and the extensive and expanding international contacts require large volume, reliable telecommunications service. The tools of the mass media--the program services of radio and television--are significant factors in forming social awareness. Telecommunications services--as parts of the production infrastructure--influence the developmental process of the economy; their absence causes significant losses; they exercise an effect on the style of life, mood and morale of the populace. It is a fact recognized in international practice and in the pertinent literature that information is an indispensable "material" part of economic development just as much as, for example, raw material and equipment. The development of telecommunications is not only a requirement, it is a condition for the intensive development of the economy.

Telecommunications becomes even more a precondition for the efficient development of production to the extent that industry, agriculture, transportation and the distribution of goods shift to more modern technology, to the extent that we want to work with more developed methods in state administration. This precondition character is increased not only by internal factors but also by those external, environmental factors which derive from international political, commercial, division of labor, tourism and cultural contacts.

Increasing efficiency in the new stage of the development of our economy and an acceleration of innovation are unimaginable without a telecommunications infrastructure substantially more developed than at present.

The present domestic situation of telecommunications services is characterized in every area, if to differing degrees, by the fact that in our homeland telecommunications has not followed proportionately the development of the economy.

Domestic Supply (31 December 1982)

1. Telephone service:
   Number of stations, 660,000
   Density, 6.1 per 100 inhabitants
   Number of sets, 1,340,000
   Density, 12.5 per 100 inhabitants

2. Telex and data transmission service:
   Number of telex stations, 9,222
   Number of data transmission stations, 987

[continued, next page]

3. Broadcast services:

		Coverage Area	Population
Kossuth program	Medium wave	82%	85%
	Medium and ultra short wave	97%	98%
Petofi program	Medium wave	45%	62%
	Medium and ultra short wave	80%	84%
Third program	Ultra short wave mono	94%	96%
	Ultra short wave stereo	61%	70%
TV first program		93%	95%
TV second program		76%	86%

The backwardness appears more in the development of the telephone network, which is supported by international comparative data, also.

In an international comparison one can establish a close interdependence between telephone density and gross national product (Figure 1). On the basis of the linear regression function which can be established in this way our level of supply can be regarded as 55-60 percent and the degree of automation as 87.1 percent. According to this our network lacks about 900,000 telephone sets, the greater proportion of which would be main stations. The low degree of automation also means that 33,000 sets and 2,000 settlements do not have continuous telephone service.

Because of the backwardness of the domestic telephone network there have been emergency or auxiliary solutions, primarily among managing organizations, but recently among the populace as well. These are primarily separate networks, independent of the postal network, radio telephone links between points and CB radio. The most strikingly uneconomical and least useful solution is when producing plants--primarily in rural areas--maintain vehicles for "information transmission" purposes.

Our telephone network is characterized by a low pace of development and increasing traffic (Figure 2). The pace of development decreased from 5.0 percent per year in the 1970's to 2.7 percent per year between 1981 and 1985, which "ensures" us last place in Europe in regard to both supply and rate of growth. In regard to its structure and tools the network finds it more and more difficult to meet the quantitative and qualitative requirements--the swiftly increasing traffic--and the technical-traffic measures of recent years have required the almost full exploitation of internal reserves (Figure 3).

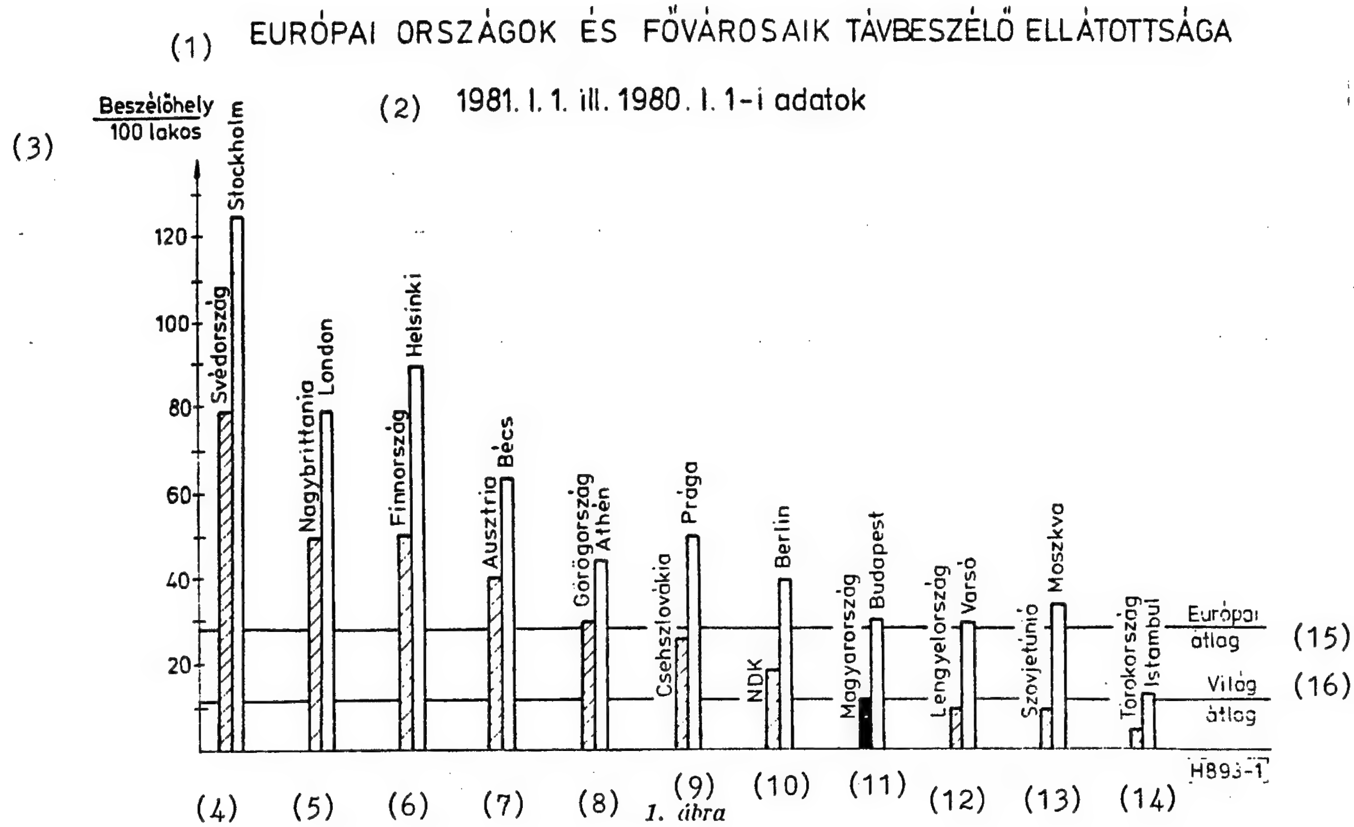

Figure 1.

Key:

1. Telephone supply of European countries and their capitals
2. Data for 1 Jan 1981 or 1 Jan 1980
3. Sets per 100 inhabitants
4. Sweden, Stockholm
5. Great Britain, London
6. Finland, Helsinki
7. Austria, Vienna
8. Greece, Athens
9. Czechoslovakia, Prague
10. GDR, Berlin
11. Hungary, Budapest
12. Poland, Warsaw
13. Soviet Union, Moscow
14. Turkey, Istanbul
15. European average
16. World average

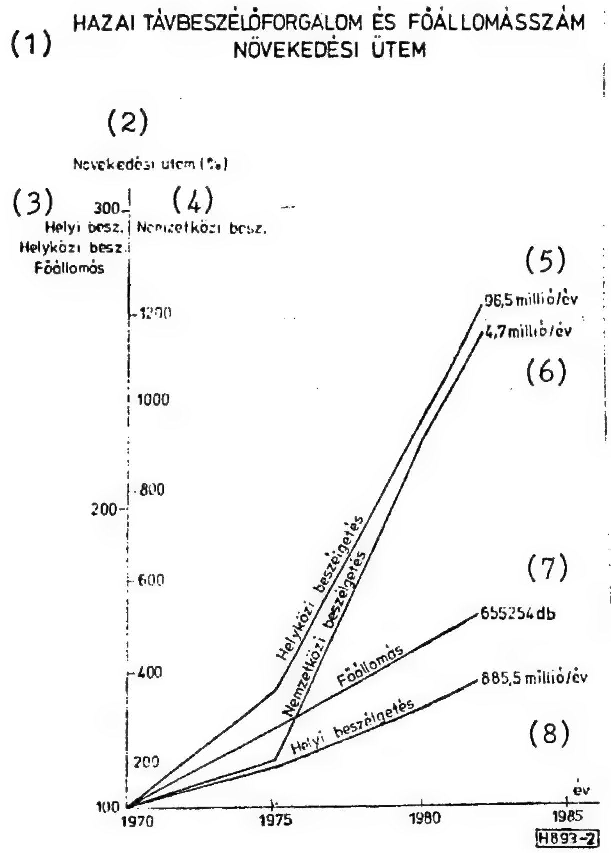

Figure 2.

Key:

1. Domestic telephone traffic and number of main stations. Rate of growth
2. Rate of growth, percent
3. Local and interurban stations
4. International
5. Interurban conversations, 96.5 million per year
6. International conversations, 4.7 million per year
7. Main stations, 655,254
8. Local conversations, 885.5 million per year

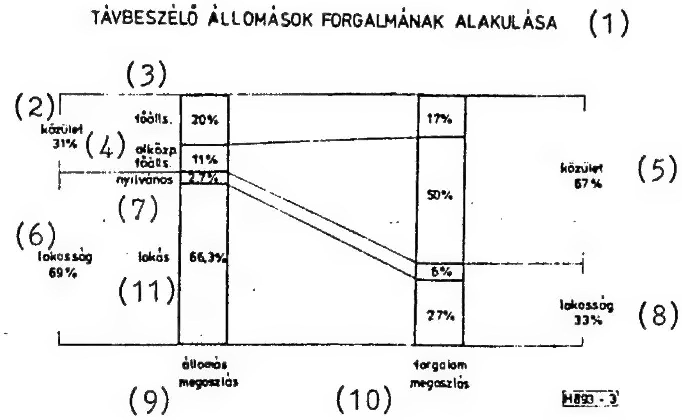

Figure 3.

Key:

1. Development of traffic of telephone stations
2. Public (administration, business)
3. Main station
4. Substation
5. Public
6. Populace
7. Open (coin)
8. Populace
9. Distribution of stations
10. Distribution of traffic
11. Residential

In combination, the foregoing results in the fact that at the end of 1982 there were 344,000 people in Hungary waiting for telephones and in regard to supply to the populace the average waiting time exceeds 10 years. The investment resources needed for a dynamic reconstruction of obsolete devices in the network exceed 14 billion forints.

The chief causes of the backwardness are: underestimating the role of telecommunications and its place in the economy, the shortage of material resources, and the relative backwardness of the development of electronic devices in industry.

From the viewpoint of the future of communications development it is important to note what deputy premier Gyorgy Lazar said at the 1981 general session of the Hungarian Academy of Sciences:

"It is a fact recognized for a long time, and proven by science many times, that a developed infrastructure is an indispensable condition for increasing the performance of the economy. The development of settlements, the housing construction and maintenance tasks, modernizing the energetics distribution network, developing modern tools for communications, education and developing the network of health institutions are, in my opinion, not only financial questions, but also require the solution of research tasks, including technical research tasks, without which we can hardly realize a rational development of the infrastructure."

A number of OMFB [National Technical Development Committee] studies and long-range postal plans for the reconstruction and development of telecommunications--primarily the telephone network--have been prepared in the past 20 years, urging a liquidation of the backwardness. These documents constituted the basis for those proposals which gave birth to government decisions:

--concerning a long-range developmental conception for the post office and telecommunications on 27 December 1979; and

--concerning the chief ideas and a system of conditions for the realization of the long-range conception for transportation and communications on 16 June 1982.

The decisions recognize the backwardness and consider necessary an acceleration of development to reach a level of supply corresponding to the level of our economic development. But in addition to ensuring the priority of development it is necessary to achieve a pace of development at least double of that at present.

The two most important elements in the system of conditions for realization of the long-range plan are:

--ensuring a resource background for development--taking into consideration also the bringing in of resources on the basis of new public and popular interest; and

--ensuring a domestic industrial background for developing the telecommunications network on a modern technical foundation.

(In regard to the problem of the economic background, I would append an idea from an article of Academician Tibor Vamos which appeared in MAGYAR TUDOMANY: "Recognizing that the production and propagation of information is a commodity like any other product, having value and use value, will mean certain changes.")

In what follows I would like to describe the chief directions for a development of telecommunications, showing also what the crucial tasks will be for industry and the Post Office in the area of research and development.

Our activity must be motivated in a fundamental way by rational development, from the technical and economic viewpoints alike. Indispensable for this is systems thinking in the area of research, development and planning, recognizing the links and mutual effects and thus selecting the optimal solutions. Even in itself the task requires an interdisciplinary approach, making use of modern operations research methods and models in seeking developmental optimums. The development policy principles for the telephone network are:

--in the interest of the reliability of the network and a significant improvement of services we must carry out a complete reconstruction of the exchanges and the transmission network, together with quantitative development;

--in the interest of continuous telephone service we must complete the automation of the network; and

--we must significantly improve the quality of service so that the ratio of completed calls reaches the European average.

It is a strategic element of development that improving the quality of the telephone network and a quantitative growth can be achieved only by replacing obsolete equipment, on a new technical and technological base. Within the framework of this we must produce the organizational and device conditions for modern operation with increasing use of electronics and computer technology.

From the viewpoint of realizing the strategic goals special significance attaches to the method of technical system change and the selection of times for it. In the area of telephone service system change means switching from electromechanical exchanges to electronic ones, building up an integrated telecommunications network with digital transmission paths, creating at the same time the centralized operations and maintenance systems needed for operations.

Network integration appears on the one hand in integration of switching and transmission technology and on the other hand in integration of services, creating a possibility for the same network to transmit both speech and other information (written text, data). A further technical possibility is the integration of subexchanges and the separate networks into a single telecommunications network.

The plan outlines of the conception take into consideration that the equipment needed for the system change can be ensured from import in the 6th 5-Year Plan and from domestic manufacture in the 7th 5-Year Plan. The decision pertaining to the purchase of licenses for stored program controlled electronic exchanges and the import of model networks create the conditions for this.

According to the technical-economic requirements for network development by the Hungarian Post Office only digital transmission systems and stored program controlled exchanges will be built after 1990. Naturally we must take into consideration that switching from analog systems to digital ones raises a number of developmental problems for the transitional period, of several decades, which must be solved in the development of equipment.

Defining the new structure of the telephone network meant new tasks for the postal experts--in close interdependence with the strategy for introduction of the digital devices (Figure 4).

The applications possibilities of new technologies ensure that we can provide the 3,122 settlements with telephone exchanges located in about 1,000 places. The sequence followed thus far in building up the telephone network--which defined development by network level from above downward--will be re-examined and development by larger network units (nodes, collecting nodes) should be considered.

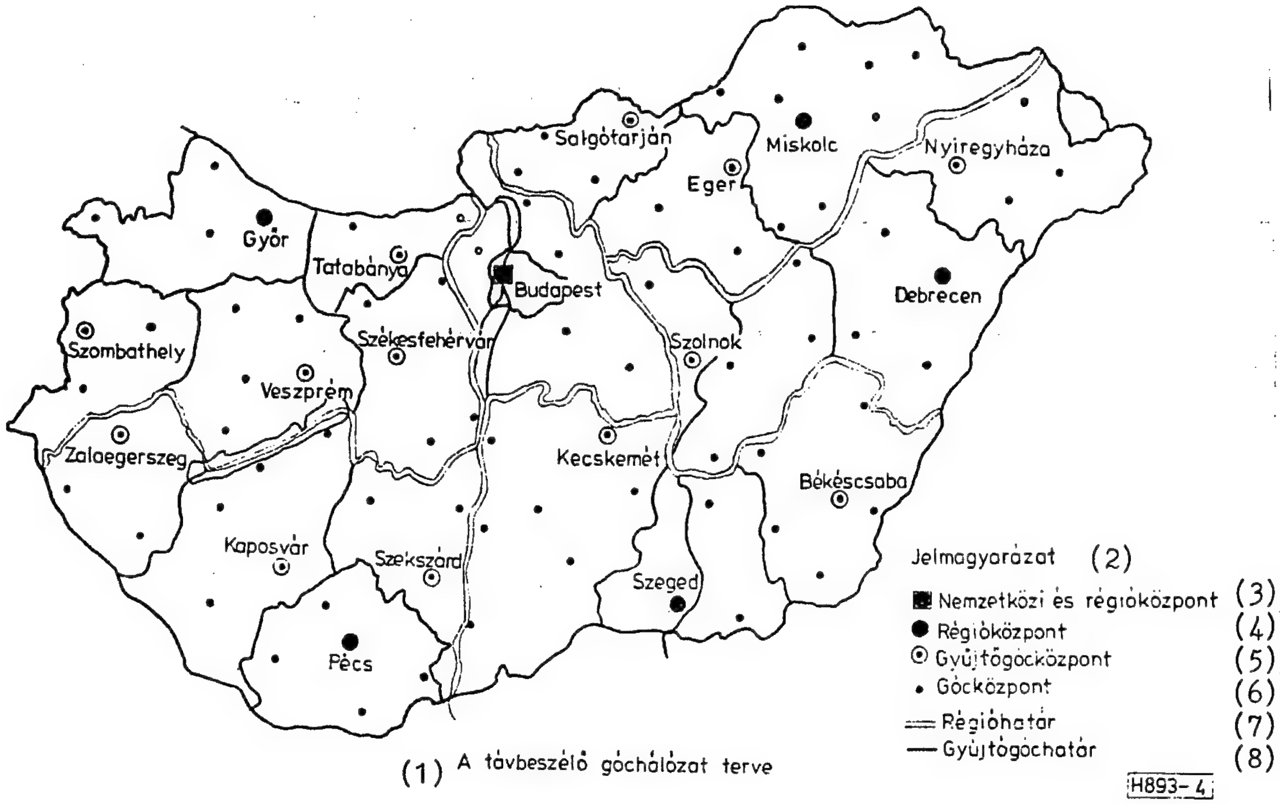

Figure 4.

Key:

1. Plan for the telephone network
2. Legend
3. International and regional center
4. Regional center
5. Collecting node center
6. Node center
7. Region boundary
8. Collecting node boundary

In developing the national system we plan new elements primarily in the Budapest and in the rural networks (Figures 5 and 6).

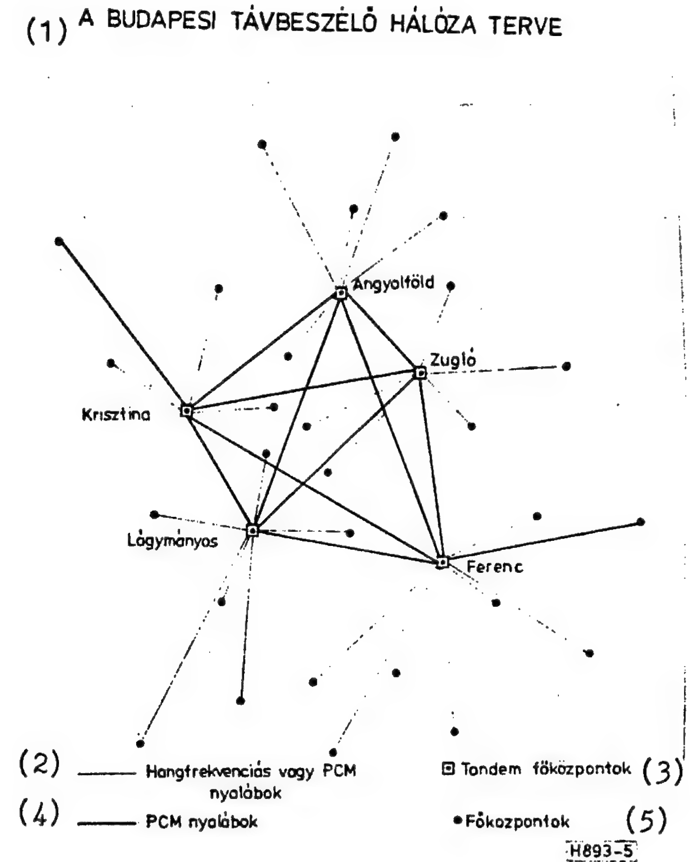

Figure 5.

Key:

1. Plan for the Budapest telephone network
2. Voice frequency or PCM packets
3. Tandem main exchanges
4. PCM packets
5. Main exchanges

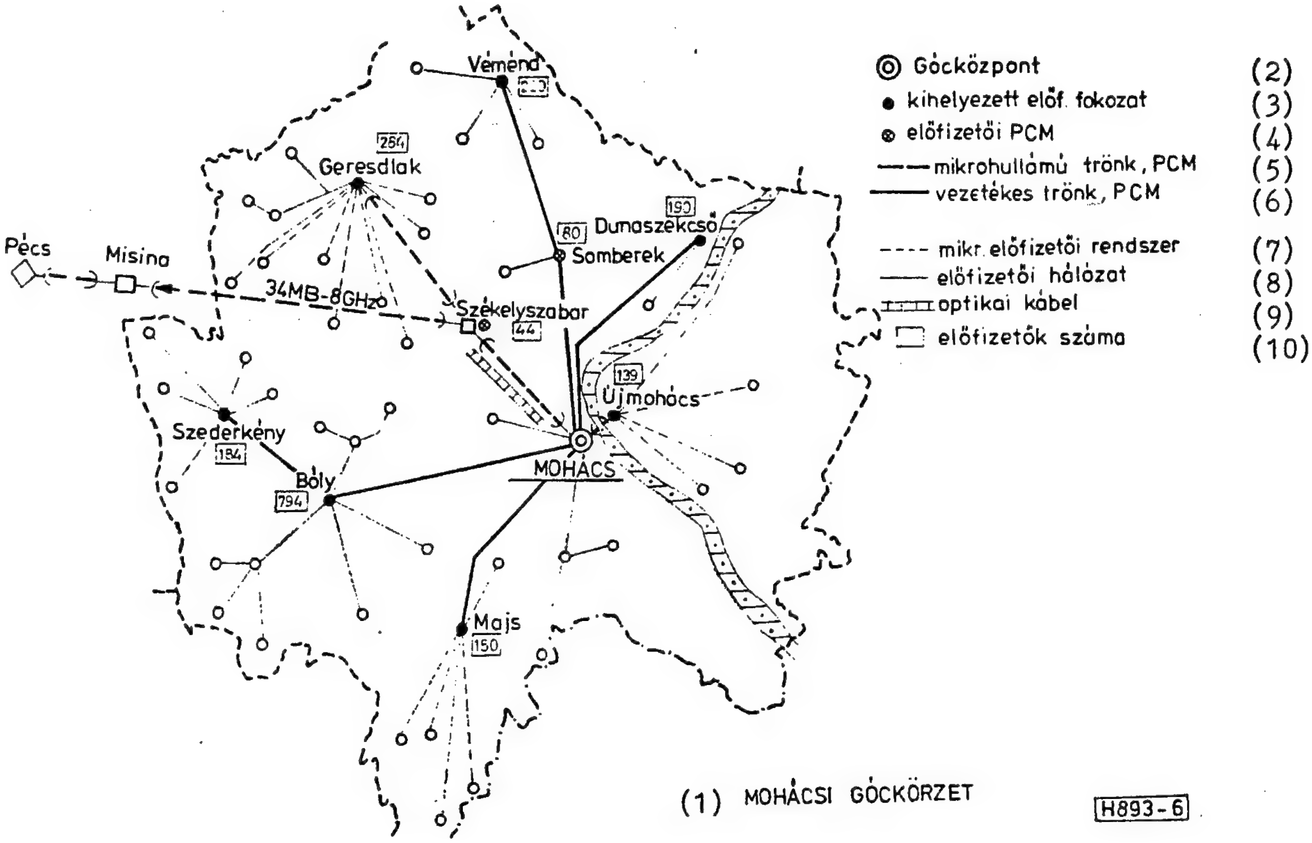

Figure 6.

Key:
1. Mohacs Node Zone
2. Node center
3. Outlying subscriber stages
4. Subscriber PCM
5. Microwave trunk, PCM
6. Landline trunk, PCM
7. Micr. subscriber system
8. Subscriber network
9. Optical cable
10. Number of subscribers

Use of the proposed digital devices in development of the telecommunications network began already in recent years; in connection with this a Budapest landline and wireless (microwave 13 GHz) trunk network has been established, partly with 2 Mbit/s and partly with 34 Mbit/s systems, with a total capacity of 3,300 telephone channels (Figure 7). Our future plan is use of optical cable, which will tie into the existing trunk network (34 Mbit/s).

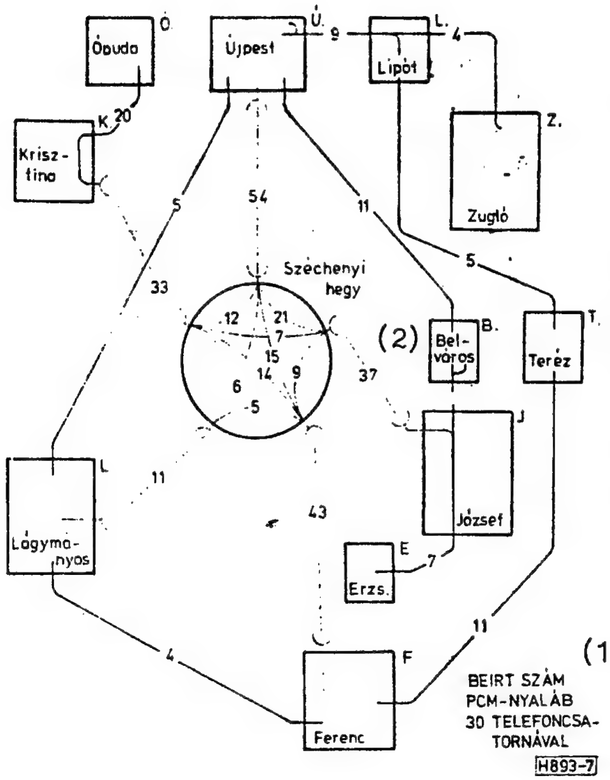

Figure 7.

Key:
1. Inscribed number PCM packet with 30 telephone channels.
2. Inner city

Execution of the long-range plan (to the year 2000) prescribes, in the case of the larger expenditure version, a telephone density of 30.7 per 100 inhabitants. In the course of this—taking into consideration the reconstruction also--we must install 2.6 million telephone sets and complete full automation of the network by 1995.

Taking into consideration the distant completion of reconstruction and automation of the network we must count on increasing tension in two areas:

--in supplying 2,800 settlements in the provinces (node exchanges and rural networks), and

--in the computer network, where a delay in building up the data transmission links could hold back the extraordinarily dynamic development.

In the two service areas research and development must do more to examine those technical possibilities which might provide a swift and economical solution for multiple use of the existing basic network and for use of equipment which, fitting into the national system, will accelerate satisfaction of demand.

In developing the telex and data transmission service it is the fundamental aspiration of the Post Office to increase the number of TX stations three times by the year 2000 on the basis of the new electronic exchange--which follows well the predicted demand--and to increase the number of data stations 10 times as compared to the present.

In addition to expanding subscriber services, introduction of the following new telecommunications services figures in our developmental plans, for example:

--mobile telephone service (radiotelephone),

--text communication procedures (interactive Videotex, Teletex, Telefax), and

--a packet switching data network.

In the area of broadcasting the chief direction of development is completion of the networks. The plan prescribes artificial statellite broadcasting for the 1990's. The planned new services in this area are a picture newspaper and a personal call system.

Development of the telecommunications network requires extraordinary and many-sided coordination between industry and the Post Office.

It is fundamentally important that equipment development, manufacture and marketing by industry have a systems view in harmony with the postal network development. In the interest of swiftly attaining the posted goal the signal technology factories and research institutes--tegether with the Post Office--must concentrate their intellectual capacities and accelerate development and the introduction of manufacture of new products.

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CSO: 2502/36

ELECTRONICS INDUSTRY IN TELECOMMUNICATIONS, TELE-INFORMATION

Budapest HIRADASTECHNIKA in Hungarian No 12, 83 pp 552-554

[Speech by Zoltan Koteles, Minister of Industry, given at the 2 May 1983 scientific session of the Hungarian Academy of Sciences: "Status and Developmental Trends of The Domestic Electronics Industry in the Area of Telecommunications and Tele-Informatics"]

[Text] Zoltan Koteles got his degree in electrical engineering in 1951 at the Budapest Technical University. After finishing at the university he began work at ORION as a technician and then became chief of quality control. Later he was appointed developmental chief engineer and after about 10 years as technical director he became director general of the enterprise. In between he was branch chief engineer of the Signal Technology Directorate and technical chief of the MHE [Hungarian Communications Engineering Association]. Since 1 July 1982 he has been deputy minister of industry.

Developed and introduced at ORION under his leadership were, among other things, the 400 MHz, the 7 GHz and the 8 GHz microwave product families. Implementation of the Computer Technology Central Development Program and the manufacture of color television began at ORION in this period also.

He is a member of the presidium of the HTE [Signal Technology Scientific Association] and of its executive committee.

Summary: The author reviews the present status and developmental possibilities of the domestic electronics industry in the area of telecommunications and tele-informatics. He describes the consumption structure and the central development program for electronic parts and subassemblies. He also describes the most important developmental tasks and developmental goals in the area of the telecommunications industry.

From the technical, scientific and social aspects alike the revolutionary changes taking place in the area of telecommunications and informatics are extraordinary and full of promise. The development of telecommunications

is very closely interdependent with electronicalization and with the entire electronics industry.

The electronics industry has developed very dynamically throughout the world in the past 25 years, even despite the recession. Its annual rate of development has exceeded 10-12 percent, and according to the forecasts this pace will be maintained for a longer time.

Not a single branch of the economy would be able to realize its tasks at the desired level today without the application of electronics. Modern leadership and guidance, communications, the transmission and processing of information, the automation of production processes, energy and material conserving technologies, agriculture and the foodstuffs industry, medicine, military technology, transportation and education can no longer do without electronics tools. The social effects of electronics are striking also.

The explosive development of microelectronics fundamentally changed the structure of the electronics industries of the developed countries. The largest scale mass manufacture in the history of technology was realized, making possible a large scale reduction in the price of electronic systems in the past 30 years.

Due to the development of science and technology, an ever greater part of the design tasks for equipment is being solved with the technology of the electronic parts industry. The significance of task-oriented circuits has increased together with the use of universal circuits.

With the task-oriented circuits the designer of the device can ensure the technically and economically optimal solution from the viewpoint of ad hoc applications.

Convergence is one of the most essential factors in the development of the electronics industry around the world. With the same technological procedures being used in various areas the structural and circuit design of devices, the selection of parts, the displays, transmission, storage and operation are becoming integrated, hardware and software systems are merging or converging.

The worldwide production and consumption of electronic devices are taking on gigantic dimensions also. In 1980 the electronics industry of the world produced products worth 360 billion dollars. The per capita consumption was $90 as a world average, but was $485 in the U.S., $470 in the FRG and $380 in Japan.

According to estimates the per capita, annual consumption of electronic products may have been between $30 and $60 in Hungary in 1981, which is very low compared to the industrially developed countries.

The forecasts make a further swift increase in consumption probable. According to the forecasts the volume of per capita consumption in Western Europe is expected to increase to $4,300 or $4,400 between 1981 and 1990.

Signal technology devices are expected to make up one quarter of all consumption of electronic devices and about 20-21 percent of the costs will be turned to computer technology devices.

Unfortunately Hungary was not able to keep up with the pace of development in the area of the electronics industry which took place in the world, although the Hungarian electronics industry has significant traditions and its weight even today is a considerable part of Hungarian industry.

135,000 people work in the trade and according to 1982 data this branch produced 25 percent of the machine industry production.

But when the explosive development of microelectronics began in the world our device manufacture came to a sudden halt--because of the underdeveloped nature of the parts industry.

Liquidating the backwardness became a vital question for the entire industry, because without a parts industry producing modern parts one cannot maintain an industry manufacturing electronic equipment or satisfy the electronics device demand of the economy.

Under such circumstances and after several years of preparatory work the Council of Ministers adopted, in December 1981, a central development program for electronic parts and subassemblies.

This program, of determining significance form the viewpoint of industrial policy, contains two large task groups--the development of microelectronic and other electronic parts and the development of RC elements, ferrites and electromechanical parts equivalent in size and reliability to the microelectronics.

The microelectronics program, of determining significance and meaning a new technical culture, poses the following as goals for the first technological phase of parts production:

The capacity of the design and master mask manufacturing system "feeding" the chip technology manufacturing lines must be 3,000 masks per year. This will create the design and manufacturing conditions for 300-400 new circuit types, or 1,500-3,000 new semifinished, equipment-oriented circuits.

The economicalness conditions are strict. A few hundred manufactured parts must be able to bear the costs of design. This is extraordinarily essential, because this will make it possible to ensure the equipment-oriented parts needs of the manufacturing branches best suited to the peculiarities of Hungarian industry.

Our wafer technology base must ensure the processing of 120,000 silicon wafers per year. We will create this capacity by purchasing and adopting Soviet know-how and largely Soviet machines. In the first step the technologies to be adopted will be suitable for manufacture of NMOS and GMOS circuits.

Assembly-encapsulation-testing capacity must fit the above. Here the chief task is to ensure the capability of putting out a very large number of types. To do this the measurement technology must obviously be put on entirely new foundations.

Transforming the product structure of the equipment manufacturing enterprises and preparing them to use the circuits mentioned must be ensured by paying extraordinary attention to the direct technical cooperation of the equipment manufacturing and parts industries.

A year and a half after the Council of Ministers resolution--in May 1983--it can be stated that progress in microelectronics is according to the progress as a whole, indeed we are farther ahead than we planned in the area of design and mask manufacture. There has been a lag in the area of other electronic parts. In the interest of decreasing the lag we established a set of priorities for the several tasks and on the basis of this we are concentrating research and development activity and investment activity on the areas most esential from the viewpoint of domestic use.

The liquidation of our backwardness in the area of electronic parts manufacture has begun with implementation of the EKFP [Electronics Central Development Program]. The question is how our electronic equipment manufacture will be able to take advantage of the possibilities offered by the parts industry. How and in what direction will it develop?

The goal is clear. The electronics industry and equipment manufacture therein must provide the device background needed for the electronicalization of the economy, together with the services.

This is a basically export offensive strategy for the electronics industry, for the electronicalization of the economy can be realized at a high level only if one part of our needs is provided from domestic resources and another part within the framework on the international division of labor. To do this we must export a good part of the products of our electronics industry--in accordance with the practice thus far, but at an ever higher level. He who cannot get his technical, technological culture recognized in world trade as a vendor will be forced to be content with lower level products as a customer also.

Taking into consideration the needs of the economy and the export possibilities, we calculate that the production of the electronics industry will increase by 8-9 percent per year over a 10-year period.

Naturally there will be significant differences in the growth of the several manufacturing branches. Manufacture of devices for professional signal technology and production of computer technology and automation devices and medical instruments will develop at a pace substantially swifter than the average.

It will be a new aspect of development that the modernization of electronic technologies which has been accelerating continuously thus far will slow in the 1980's; development will be defined not by the modernization of technology

but rather by user demand. It appears that even now the users are not capable of exploiting all those possibilities which contemporary devices offer, so the development of applications will come into the foreground rather than the development of technology. So the chief attention must be concentrated on the links between electronic systems and their environment.

Communications has special significance within the electronics industry, not only because this branch provides a quarter of the production of the profession but also because the social, military technology and economic significance of communications is extraordinarily great also. The swift, precise, faithful transmission of information has become part of the life of mankind and a most important tool for its development. Communications has become a "material" part of economic and social life; the demand is increasing more swiftly than the increase in national income.

The sums used for the development of Hungarian communications came to only three thousandths of the total national product in the years 1974-1978. As a result of the inadequate development the level of communications services declined and the unsatisfied part of the need of the economy and of society for communication increased. A few years ago a qualitative transformation in communications and in mass communications techniques began in the world with the appearance of the highly integrated devices of microelectronics.

It is a fundamental aspect of this transformation that today already in a broad sphere of information transmission procedures it is possible to store electronically large volumes of information directly, pass it on and, thanks to transmission procedures better and swifter than before, set up network services with better conditions.

The needs and the prospects are enormous. One may justly ask, how the Hungarian telecommunications industry will be able to meet this challenge. Our telecommunications industry, more than 100 years old, has beautiful traditions. Up to the end of the 1950's this telecommunications industry produced primarily for domestic needs; beginning in the 1960's it joined to an ever greater degree in satisfying the needs of the socialist countries, primarily the Soviet Union. For this development the telecommunications industry had good traditions, an outstanding intellectual base and a suitable technical-technological level. Until the end of the 1970's it was able to satisfy domestic needs for basic products while exporting about 70 percent of its production. Unfortunately, disadvantageous changes had taken place by the end of the 1970's; the design level of our equipment could not follow the pace of international development, we had no way to develop our manufacturing technology at the desired pace, but the most serious problem was that the electronic parts background increasingly lagged behind what was required.

In this situation it became necessary to prepare a medium-range research and development program, raised to the national level, for a coordinated, systems view execution of the most important research and development tasks which would define the future. As a result of this program a modern commodity base will be available in the Sixth 5-Year Plan period, and a foundation is being laid for the marketing goals of the Seventh 5-Year Plan period also.

In addition to a concentration of domestic research and development resources and a substantial increase in efficiency, realization of the research and development program requires the purchase of licenses in switching technology, in landline transmission technology and in microwave technology.

The significance of a qualitative development of postal-industrial contacts has increased extraordinarily. A close link between planning and operations provides information which--if it is used--will bring manufacturer and user interests closer together and improve the market conditions for industry.

Creating domestic networks is indispensable for increasing export also, for industry cannot do without the references of the largest domestic user, especially in the event of complex systems export.

The most important developmental tasks in the area of the telecommunications industry can be summed up as follows--not touching on questions of special development:

--There is need for comprehensive, coordinated systems technology research in the area of telecommunications networks and systems, taking into consideration the mutual effects of the new modulation methods, micro-electronics, special purpose computers and the new technologies.

--In switching technology, research and development must be conducted primarily in the area of time sharing, stored-program-controlled, electronic exchanges.

--There is need for broad research and development in the area of digital transmission technology. The long-range coexistence of analog and digital systems makes necessary the digitalization of signal sources and analog-digital transformation.

--We must increase the information transmission capacity of telecommunications equipment, the speed of transmission and the upper limit of the transmission frequency band.

--We must develop our manufacturing technologies; we must increase mechanization and automation and the use of computerized methods.

--We must improve the reliability and life expectancy of equipment by an order of magnitude, we must decrease energy and maintenance needs, and we must expand the circle of equipment which runs without supervision.

Concrete research and development work in the area of telephone exchanges is directed at development of modern, electronic digital switching equipment. We will manufacture a family of electronic main exchanges on the basis of license purchases and we will manufacture subexchanges on the basis of domestic development.

In the area of landline and wireless transmission technology our goal is the delivery of complete zone and spine network transmission systems and networks made up of these. In addition to a further development of existing analog

systems we will manufacture digital (PCM) landline and microwave systems. In microwave communications we count on a further spread of digital techniques, an extension of the frequency bands (to 20-30 GHz), an increase in transmission capacity and an increase in transmission speeds.

The chief developmental goal for ultrashortwave radiotelephone systems is to produce the devices needed to set up stable, reliable complex networks, in the longer run with the introduction of the digital (PCM) modulation system and by making use of higher frequencies.

In the area of data transmission equipment the task is to develop fourth generation systems, to develop intelligent terminals which can carry out more complex tasks and to manufacture subscriber devices for viewdata and teletext systems.

The chief trends in the development of broadcast transmitting equipment point toward highly automated, more efficient equipment which requires less energy and space.

We must reckon also with the use of space telecommunications and artificial satellite broadcasting.

In the area of telephone equipment also we must reckon with the spread of electronics. In accordance with the system and equipment development goals, the assortment of communications cables must be modernized also.

An analysis of the international contacts of our telecommunications industry would merit a separate chapter for there is broad cooperation with the enterprise of socialist and capitalist countries alike.

To sum up, we calculate that in the next 10 years the manufacture of communications devices will increase at such a rate that by the end of the decade its ratio within the electronics industry will increase to 35-36 percent. Export will increase also together with increasing production. In 1990 we will be exporting 75-80 percent of our total telecommunications device production.

With the realization of our developmental goals our telecommunications industry will catch up to the international level setting the standard; it will be capable of satisfying a significant part of the domestic demand in such a way that it will remain an export-oriented branch and expand its sales on capitalist and socialist markets alike.

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BRIEFS

COMPUTERIZED NERVE CELL MODEL--A team of scientists from the Biocybernetics Institute of the Krakow Academy of Mining and Metallurgy have constructed a unique mathematical model of a nerve cell. The computer-encoded describtion of the nerve cell enables scientists to retrace accurately whole fragments of nerve systems. This development, scientists say, also marks the starting point for research on the cybernetical model of the human brain. [Text] [Warsaw PAP DAILY NEWS in English 16 Feb 84 p 41]

RESEARCH INTO COAL PROCESSING--Experts at the Institute of Chemical Coal processing at Zabrze in southern Poland obtained for the first time a valuable raw material for fuel fractions, known as primary tar, from brown coal subjected to high-speed degassing carried out on a test scale as part of Poland's research in fuel production from unconventional raw materials, chiefly hard and brown coal. At the Oil and Coal Chemistry and Technology Institute at the Wroclaw Technical University in southwestern Poland, experts have worked out a method of processing the Zabrze primary tar into fuels by way of hydrogenation. The results were employed in experiments on continuous operation installations. The final product is a liquid whose main fractions are gasoline and engine oil. The process is marked by low consumption of hydrogen. The experiments indicate the new method may be a good way to obtain liquid fuels from coal. [Text] [Warsaw PAP DAILY NEWS in English 13 Mar 84 pp 22, 23]

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